

Joint Research (JR) Training Rodent Research and General JR

July 2016

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Outline



- ◆ Flight changes for Rodent Research (RR) missions
- ◆ RR Operator training for cosmonauts
- ◆ Protocol affecting I53/54 (52S/53S)
- ◆ Training Proposal for I53/54
- ◆ Backup slides
 - ◆ RR-5 Tasks
 - ◆ Russian Rodent Mission Tasks
 - ◆ Other Joint Research
 - ◆ Tools Training and Support
 - ◆ Payload Rack Training
 - ◆ Rodent Research Training Flow
 - ◆ Rodent Research Training Objectives
 - ◆ Rodent Research Hardware



Flight Changes for Rodent Missions



- ◆ Changes in Flight schedules for Rodent Research (RR)
 - ◆ RR5 has moved up to SpX-11 (from SpX-12)
 - ✦ Current Launch 2/1/17 – Increment 50/51
 - ◆ Russian Rodent mission and/or JAXA RR (TBD) SpX-12
 - ✦ Current Launch 6/1/17 – Increment 51/52
 - ◆ RR6 or Russian Rodent mission (TBD) SpX-13?
 - ✦ Current Launch Sept 2017 – Increment 52/53/54
- ◆ All Joint Rodent Research missions beginning with RR5 will involve special skills and will require operator level training for cosmonauts (as defined on the following slide).
- ◆ Indications are that Rodent Joint Research is going to continue indefinitely and that the Rodent missions will alternate with each Space X flight between a Joint Research and a Russian Crew Ops missions. Example: SpX-11 is Joint Research; SpX-12 is expected to be a Russian Crew Ops flight; SpX-13 would be Joint Research (TBD);



RR Operator Level training for Cosmonauts



The following facility and Rodent Research classes are required for operators (based on current RR5 & Russian Rodent Mission tasks)*:

◆ Animal Consent Briefing**	(0.50 Hr.)
◆ Animal Care Briefing	(0.50 Hr.)
◆ Generic Rodent Skills Lab	(4.00 Hr.)
◆ Rodent Habitat Animal Transfer	(1.25 Hr.)
◆ Rodent Habitat Familiarization	(2.00 Hr.)
◆ Rodent Skills 1 (See backup for details)	(3.00 Hr.)
◆ Rodent Skills 3 (See backup for details)	(3.00 Hr.)
◆ Rodent Skills 4 (See backup for details)	(3.00 Hr.)
◆ Rodent JR Increment Skills	<u>(3.00 Hr.)</u>
Total Rodent Training	20.25 Hr.***
◆ HRF Rack Familiarization	(0.25 Hr.) support class
◆ HRF Refrigerated Centrifuge	(0.50 Hr.) support class
◆ Cold Transfer Skills	(1.00 Hr.) support class
◆ MSG Facility Familiarization	(1.00 Hr.) support class
Total Support classes	2.75 Hr.

*If dissections or other TBD tasks are added, training hours could increase by 8 hours or more. (current tasks are in backup slides)

**ICBs expected to take place in Russia starting in July/August 2016 with 51S & 52S cosmonauts

***Interpretation time will be added – in general 30% overhead = total of 30 hrs.



April 2016 Protocol



JR proposed training for 52S & 53S (I53/54) is based on April protocol list of science experiments. **We need Energia to send I53/54 Research Program to GCTC to support training preparation in Aug and training start in September 2016.**

NASA-Roscosmos Joint Research Plan

8-Apr-16 Preliminary Increment lists for Long Term Program Integration, Planning, and Training, subject to change with additional agreements as developed.

Times are estimates based on the scientific and Program Manager's agreements.

Actual times will be determined by Joint Planning community.

RUSSIAN CREWMEMBER TIME FOR RESEARCH

Increments	Start	Weeks
51/52	25-Feb-17	27,3

Task	Estimated Hours	Hrs/Wk
Primary Joint Research		
MARES 49S crew (Note 1)	29,50	
MARES 51S crew (TBD-1)	59,17	
Rodent Res. 5, SpX-12: (TBD-5)	40,00	
Cool Flames Investigation Experiments	TBD-3	
ACME Combustion Experiments (TBD-7)	30,00	
Robonaut (TBD-4)	17,00	
SPHERES-ZR (Middle School) (TBD-2)	15,33	
UBNT+Bar	3,00	
EarthKAM (2 sessions) (TBD-6)	6,00	
Total hrs & hrs/wk	200,00	7,33

Increments	Start	Weeks
53/54	8-Sep-17	26,4

Task	Estimated Hours	Hrs/Wk
Primary Joint Research		
MARES 51S crew (TBD-1)	29,50	
Joint Rodent Mission 1, SpX-13: (TBD-5)	100,00	
Rodent Res. 6, SpX-14: (TBD-5)	0,00	
ACME Combustion Experiments (TBD-7)	30,00	
Robonaut (TBD-4)	TBD	
SPHERES-ZR (High School)	16,33	
UBNT+Bar	3,00	
EarthKAM (2 sessions) (TBD-6)	6,00	
Total hrs & hrs/wk	184,83	7,00



Proposed training for I53



Joint Research training planned: (hours below do not include interpretation)

All cosmonauts will receive payload rack training*. Both Skv & Vgn will have the below red text placeholders in their payload training plan until assignments &/or ICB are completed. GCTC concurrence needed by August 5, to support training start in Sept 2016.

I53 (52S) / Skvortsov and Vagner

- ★ Payload Rack training for cosmonauts has been approved via ITCB, ETRIP, and MPTP to begin with I53/54 (52S). Classes are scheduled in September for Skv & Vgn.

◆ Payload Rack classes, 4.5 hrs.

- ✦ EXPRESS Rack, 1 hr.
- ✦ HRF Rack, .25 hr.
- ✦ HRF Refrigerated Centrifuge, .5 hr.
- ✦ HRF Ultrasound 2, .25 hr.
- ✦ MELFI, .75 hr.
- ✦ MSG, 1 hr.
- ✦ WORF, .75 hr.

◆ Rodent Research (Operator) – 21.25 hrs.

- ✦ Consent Briefing, .5 hrs. **
- ✦ Care Briefing, .5 hrs. (Sept 2016)
- ✦ Generic Rodent Skills, 4 hrs. (Sept 2016)
- ✦ Rodent Skills 1, 3 hrs. (Dec 2016)
- ✦ Rodent Skills 3, 3 hrs. (May 2017)
- ✦ Rodent Skills 4, 3 hrs. (May 2017)
- ✦ Rodent JR Increment Skills, 3 hrs. (June 2017)
- ✦ Rodent Habitat Animal Transfer, 1.25 hrs. (June)
- ✦ Rodent Habitat Fam for JR, 2 hrs. (June 2017)
 - ◆ Support classes:
 - ✦ Cold Transfer Skills, 1.0 hrs. (June 2017)

◆ FCF Cool Flames/ACME JR, 3.5 hrs.

- ✦ Cool Flames/ACME specific, 2 hrs. (June 2017)
- ✦ Support classes, 1.5 hrs. (MWA & ARIS) (May)

** Expect ICBs to be in Russia in July/August 2016 – if not, Sept at JSC.



Proposed training for I54



Joint Research training planned: (hours below do not include interpretation) Payload training plan **will have the below red text placeholders for Ryz until assignments &/or ICB are completed. GCTC concurrence is needed in August, to support training start in Nov 2016.**

I54 (53S) / Ryazanskiy

◆ Payload Rack classes, 4.5 hrs.

(November 2016)

- ✦ EXPRESS Rack, 1 hr.
- ✦ HRF Rack, .25 hr.
- ✦ HRF Refrigerated Centrifuge, .5 hr.
- ✦ HRF Ultrasound 2, .25 hr.
- ✦ MELFI, .75 hr.
- ✦ MSG, 1 hr.
- ✦ WORF, .75 hr.

◆ Rodent Research (Operator) – 21.25 hrs.

- ✦ Consent Briefing, .5 hrs. *
- ✦ Care Briefing, .5 hrs. (Nov 2016)
- ✦ Generic Rodent Skills, 4 hrs. (Nov 2016)
- ✦ Rodent Skills 1, 3 hrs. (Feb 2017)
- ✦ Rodent Skills 3, 3 hrs. (June 2017)
- ✦ Rodent Skills 4, 3 hrs. (June 2017)
- ✦ Rodent JR Increment Skills, 3 hrs. (Aug 2017)
- ✦ Rodent Habitat Animal Transfer, 1.25 hrs. (Aug)
- ✦ Rodent Habitat Fam for JR, 2 hrs. (Aug 2017)
 - ◆ Support classes:
 - ✦ Cold Transfer Skills, 1.0 hrs. (Aug 2017)

◆ FCF Cool Flames/ACME JR, 3.5 hrs.

- ✦ Cool Flames/ACME specific, 2 hrs. (June 2017)
- ✦ Support classes, 1.5 hrs. (MWA & ARIS) (Feb)

* Expect ICBs to be in Russia in July/August 2016 – if not, Nov at JSC.



Backup



RR-5 Tasks



- ◆ Transfer animals from 2 Transporters to 4 Habitats
- ◆ Initial MSG Set up for the mission duration
- ◆ Animal Transfer from Habitats to MSG (Multiple times)
- ◆ Cleaning of the Access Unit after activity
- ◆ Gather and organize operational support hardware in MSG for Operations
- ◆ Transfer animals from 2 Habitats to 1 Transporter (if Live Animal Return)
- ◆ Perform Bone Densitometry
- ◆ Insert science samples into MELFI
- ◆ Final MSG Clean up and Stow, post mission
- ◆ End of mission inventory check
- ◆ Habitat Preparation & Insert into Express Locker
- ◆ Bag and Stow Transporter
- ◆ Change out of food bars in Habitat Refresh
- ◆ Water Box checks
- ◆ Bag and Stow Habitat
- ◆ Perform Injections and Recovery in MSG
- ◆ Perform Euthanasia (Cardiac Puncture) in MSG



Russian Rodent Research Mission Assumptions

- ◆ All rodent on orbit operations will be done by cosmonauts.
- ◆ Animals up/down on the same flight (~30 days)
- ◆ No dissections
- ◆ Euthanize and freeze
- ◆ Bone densitometry and anything requiring anesthesia recovery is TBD
- ◆ Other ops on-orbit (such as injections) – science objectives and content are not fully defined and are still being discussed
- ◆ No new Experiment Unique Equipment or on-orbit operations
- ◆ Crew time target 50 – 100 hrs (depending on final science objectives)

Disclaimer: Tasks and science content of the mission is still being determined. The above is assumed but not confirmed. Long term goal is to have Russian crew only missions as a standard once per year.

If dissections and other TBD tasks are added to mission tasks, the training time could increase by 8 hours or more.



Other Joint Research



- ◆ Cool Flames & ACME (4.5 Hrs.) 3.5 Hrs. w/o Interpretation
 - ◆ 2 Hrs. Cool Flames and/or ACME specific
 - ◆ 1.5 Hrs. system prerequisites
 - ◆ 1.0 Hrs. (30% for interpretation)
- ◆ Fluid Shifts – (18.5 Hrs.)/14 Hrs. w/o Interpretation (completed with Increment 50 crewmembers)
 - ◆ Hours do not include BDC
 - ◆ 11.75 Hrs. Fluid Shifts payload training
 - ◆ 2.25 Hrs. Med Ops prerequisites
 - ◆ 4.5 Hrs. (30% for interpretation)
- ◆ Robonaut – currently no ground training
- ◆ SPHERES-ZR – currently no ground training
- ◆ EarthKAM – currently no ground training



Tools Training & Support



- ◆ Interpreters will be able to support Sims, crew training, and other activities to prepare for Rodent missions
- ◆ Interpreters will be trained on all Joint Research payloads so that they have a better understanding of concepts
- ◆ Interpreters will support on orbit operations
- ◆ All cosmonauts will receive payload rack training beginning with I53/54 crews. (Details in next slide)
- ◆ Procedures for training and on orbit use are translated
- ◆ Crew training will be conducted over several US trips in order to build required skills
- ◆ Time for interpretation will be added to all classes
- ◆ Cosmonauts will participate in RO Sims where extra tools training will be provided – refresh and practice using IPV/PODF, OPTIMUS Viewer, Stowage Notes, and calls to POIC in Huntsville. (Lesson learned)



Payload Rack Training



◆ Agreement in place to train all cosmonauts on payload racks as follows – beginning with I53/54 cosmonauts:

- ◆ MELFI (.75 Hr.)
- ◆ EXPRESS RACK (1 Hr.)
- ◆ MSG (1 Hr.)
- ◆ HRF RACK (.25 Hr.)
- ◆ HRF Ultrasound 2 (.25 Hr.)
- ◆ HRF Refrigerated Centrifuge (.5 Hr)
- ◆ WOLF (.75 Hr.)
- ◆ 30% interpretation = ~1.25

Total for above racks = 5.75 Hrs.



Typical Rodent Research Flow for USOS, page 1

- ◆ Pre-assignment
 - ◆ Generic Rodent training (includes consent briefings)
 - ◆ 40 hours (one week) optimally
 - ◆ 16 hours (2 days) minimally – when a crewmember is identified too late to get the total week
 - ◆ **Cosmonauts are planned for 4 hours**

- ◆ Payload Facilities – Assigned Flow
 - ◆ MELFI Fam – .5 Hr.
 - ◆ MSG Fam – .75 Hr.
 - ◆ HRF Rack – .25 Hr.
 - ◆ HRF Refrigerated Centrifuge – .25 Hr
 - ◆ Cold transfer Skills – 1 Hr.



Typical Rodent Research Flow for USOS, page 2



◆ Skills – Assigned Flow

◆ General Skills

- ✦ Rodent Skills 1 – 3 Hrs.
- ✦ Rodent Skills 2 – 3 Hrs.
- ✦ Rodent Skills 3 – 3 Hrs.
- ✦ Rodent Skills 4 – 4 Hrs.
- ✦ Rodent Habitat & Animal Transfer – 1.25 Hrs.

◆ Increment Specific Skills

- ✦ Increment Specific Skills – 4 Hrs.
- ✦ Increment JR Specific Skills – 3 Hrs.

◆ Totals

- ✦ Pre-assignment: 40 Hours
- ✦ Increment Specific: 24 Hours



Rodent Research Lesson Objectives, p. 1

- ◆ Skills 1 Objectives (on bench top)
 1. Animal handling/scruffing
 2. Subcutaneous (SubQ) injection
 3. Intraperitoneal (IP) injection, verify no toe pinch reflex
 4. Cardiac puncture (open-chest and closed-chest methods); 0.5 mL blood minimum
 5. Cervical dislocation
 6. Carcass preparation
- ◆ Skills 2 Objectives (not required for Increment 51-54 cosmonauts, due to heavy dissection objectives of the class)
 1. Animal handling/scruffing
 2. Subcutaneous (SubQ) injection refresher/practice
 3. Intraperitoneal (IP) injection refresher/practice; verify no toe pinch reflex
 4. Cardiac puncture (open-chest and closed-chest) refresher/practice; 0.5 mL minimum
 5. Cervical dislocation refresher/practice
 6. Removal of spleen
 7. Removal of liver
 8. Removal of bilateral hind limbs
 9. Removal of bilateral eyes
 10. Removal of brain
 11. Carcass preparation



Rodent Research Lesson Objectives, p. 2



- ◆ Skills 3 Objectives (Same as Skills 1, but inside MSG simulator. Skip Grip Strength for cosmonauts)
 1. Animal handling/scruffing
 2. ~~Grip Strength measurements~~
 3. Subcutaneous (SubQ) injection
 4. Intraperitoneal (IP) injection; verify no toe pinch reflex
 5. Cardiac puncture (open-chest and closed-chest methods); 0.5 mL blood minimum
 6. Cervical dislocation
 7. Carcass preparation
- ◆ Skills 4 Objectives (Inside MSG simulator; eliminate dissection skills for cosmonauts. Reduced time from 4 to 3 hours)
 1. Animal handling/scruffing
 2. Subcutaneous (SubQ) injection refresher/practice
 3. Intraperitoneal (IP) injection refresher/practice; verify no toe pinch reflex
 4. Adhesion of animal to Exam Tray and use of the Exam Box for bone densitometry scanning; application of eye ointment
 5. Use of the Anesthesia Recovery System (ARS) and recognition of recovery signs
 6. Cardiac puncture (open-chest and closed-chest) refresher/practice; 0.5 mL minimum
 7. ~~Dissection and tissue collection practice~~
 - ◆ ~~a. Spleen~~
 - ◆ ~~b. Liver~~
 - ◆ ~~c. Eyes~~
 - ◆ ~~d. Brain~~
 - ◆ ~~e. Hind limbs~~
 - ◆ ~~f. Tissue preparation/use of Rodent Tissue Box~~
 8. Cervical dislocation
 9. Carcass preparation

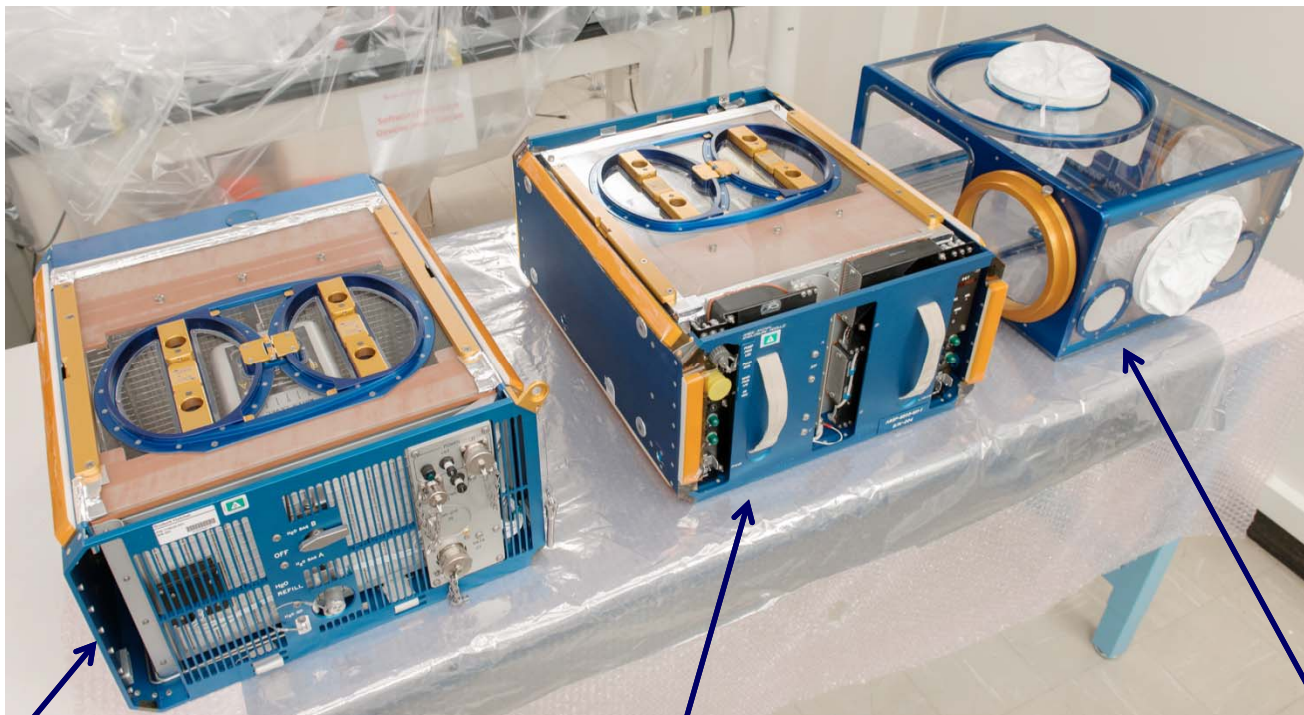


Rodent Research Lesson Objectives, p. 3



- ◆ Increment Specific Skills (RR-5/UCLA, inside MSG simulator)
 1. Animal handling/scrudding
 2. Subcutaneous (SubQ) injection
 3. Intraperitoneal (IP) injection
 4. Adhesion of animal to Exam Tray and use of the Exam Box for bone densitometry scanning; application of eye ointment
 5. Use of the Anesthesia Recovery System (ARS) and recognition of recovery signs
 6. Cardiac puncture (closed-chest); minimum of 0.5mL per animal
 7. Cervical dislocation (secondary method of euthanasia)
 8. Carcass preparation

Rodent Research Hardware Overview



HABITAT

- 10 mice or 3 – 6 rats
- No thermal control
- Video monitoring (4 cameras)
- Lighting (Visible and IR)
- In-flight access
- Launches and returns passive

TRANSPORTER

- Up to 20 mice, up to 12 rats
- Powered for ascent
- Powered on ISS during Animal Transfer Operations
- No visual checks of the animals (no cameras)
- Lighting (Visible)
- Returns passive for used Transporters, returns powered for live animal return

ACCESS UNIT

- Attaches to either Transporter or Habitat
- Provides for animal access and transfer of animals
- Remains on orbit in stowage between increments

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- A photograph of the interior of a hyperbaric chamber, showing medical supplies, two 'Mini Coldbag' storage units, and two circular viewing ports. The chamber is filled with various medical equipment and supplies, including bags of fluid, boxes, and tools, all secured with red straps.